

PUBLIC HEALTH ACT,
(11 & 12 Vict., Cap. 63.)



R E P O R T

TO THE

GENERAL BOARD OF HEALTH,

ON A

PRELIMINARY INQUIRY

INTO THE SEWERAGE, DRAINAGE, AND SUPPLY OF
WATER, AND THE SANITARY CONDITION
OF THE INHABITANTS

OF THE TOWN OF

AYLESBURY.

By **WILLIAM RANGER, Esq., C.E.,**
SUPERINTENDING INSPECTOR.



L O N D O N :

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1849.

NOTIFICATION.


THE General Board of Health hereby give notice, in terms of section 9th of the Public Health Act, that on or before the 16th May, written statements may be forwarded to the Board with respect to any matter contained in or omitted from the accompanying Report on the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the Town of AYLESBURY, or with respect to any amendment to be proposed therein.

By order of the Board,

HENRY AUSTIN, *Secretary.*

14th April, 1849.





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PUBLIC HEALTH ACT (11 and 12 Vict., Cap. 63.)

Report to the General Board of Health, on a Preliminary Inquiry into the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the Town of AYLESBURY. By WILLIAM RANGER, C.E., Superintending Inspector.

MY LORDS AND GENTLEMEN,

London, Feb. 15th, 1849.

THE following Report, which I now submit for your consideration, is founded upon the evidence received at the public inquiry, held on the 7th of December, 1848, and upon a subsequent exploration of the town and district of Aylesbury and hamlet of Walton, in accordance with your instructions.

In conducting this inquiry, and in the endeavour to form a correct view of the sanitary state of the town, I was assisted by the Rev. J. R. Pretyma, vicar; Rev. A. Baker, Curate; R. Ceily, Esq. and W. B. Peckers, Esq., medical practitioners; Thomas Tindal, Esq., treasurer to the county; H. Hatton, Esq.; Messrs. Gurney, Gibbs, Field, Watts, and Woolers, surveyors and inspectors; J. Parrots, Esq., clerk to the Union; Mr. H. Bull, relieving officer; G. L. Brown, Esq.; Messrs. Fowler, Green, Harris, and others. And also by the labouring class and the poor, who afforded me a ready access to various parts of their habitations.

The town of Aylesbury is spread over a gentle acclivity rising out of the vale of Aylesbury, as shown in the plan of the drainage area annexed. It is separated from the hamlet of Walton by the river Thame, which extends along the western side of the town in its course through the vale. The hamlet of Walton likewise stands on a gentle acclivity, on the eastern side of which a canal commences; this canal, after a course of about seven miles unites with the Grand Junction Canal. Connected with the river Thame near the town are two mill streams, one in the hamlet of Walton on the east, and the other in the parish of Aylesbury on the west.

The soil is in great part composed of a tenacious clayey loam upon a subsoil of oolitic stone and kimmeridge clay. The hamlet of Walton stands on a similar formation.

The distribution of vegetable humus is uniform and affords an average crop, but the subsoil is of a retentive and impervious nature and subject to periodical inundations, arising in great mea-

sure from the want of sufficient and properly directed water courses. The atmosphere of a town necessarily and invariably partakes of the humidity of the surrounding district; and the agricultural produce to some extent is affected by the excess of moisture, of which the trees give evidence. Within the town also, the damp is apparent in the walls of the buildings.

The prevailing wind is south by west; and according to the observations of Mr. Dell, by whom a very accurate meteorological register for Aylesbury has been kept, fogs rarely appear to hang over the town, although they are frequently formed on the lower surrounding grounds.

The population, according to the census of 1831, amounted to 5021; and in 1841, to 5429, thus showing an increase in the 10 years of 408.

The number of houses in which the population was lodged in 1831 amounted to 990, and in 1841, to 1065; showing an increase of 75 houses during the period of 10 years. The average number of persons per house in 1831 were $5\frac{1}{10}\frac{2}{5}$, and in 1841, $5\frac{1}{10}\frac{6}{5}$. But upon examining the dwellings of the lower class subsequently to the public inquiry, I ascertained that in a lodging-house, kept by Mr. J. Allen, five beds were placed in a room 17 feet long by 9 feet wide; each bed contained two persons, the height of the room being only 5 feet 6 inches. In another instance, four beds were discovered in a room 16 feet long by 8 feet 6 inches wide, with seven persons sleeping in them; the height of the room being 7 feet 6 inches; and these are not the only instances of overcrowded dwellings.

The Board will see that the mortality of the Aylesbury district for the year 1841, the year that the census was taken, amounted to 534, out of a population of 22,134.

But no essential reason appears why the mortality of Aylesbury should be higher than in Wycombe district of the same county, where out of a population of 34,150, the deaths for the same year were 751 only.

One of the best known tests of the sanitary condition of a district is furnished by the infantile mortality, which is independent of occupation, migration, or emigration, or the casualties affecting adult life, and we find for that one year that of the children born within the year, whilst one in every nine dies at Wycombe, one in every seven dies at Aylesbury: that whilst 32·8 per cent. die before they pass the fifth year in the less unhealthy district, at Aylesbury 37·2 per cent. have been cut off.

The proportion of deaths of children in the less unhealthy district was 1 in 45, and in Aylesbury 1 in 41.

But the rate of births is increased in proportion, so that a certain number of children in the unhealthy district appear to be born only to die prematurely.

The average age attained at Wycombe was 32 years and 10

months, whilst at Aylesbury it was 28 years and 3 months, making 4 years and 7 months of difference to each individual dying.

Every adult who died at Aylesbury above 20 years of age was cut off about two years sooner than at Wycombe.

Taking the mere money estimate of the loss of working ability to each adult male or female at 7s. 6d. per week, the money value of the lost labour of those that died within that one year was upwards of 8500*l.*

But each case of premature mortality only represents 28 cases of sickness, an excess which would make the excess of sickness bill for that one year in Aylesbury, 1260*l.* at 1*l.* per case. Added to this is the loss of 225*l.* during the one year for an excess of funerals; taking the cost for each funeral at the average of 5*l.*, the total of these items.

Lost labour,
Excess of sickness,
Excess of funerals,

was during that year, 10,377*l.*

On examining the mortuary registration, it appears that among the most prominent causes of mortality are the preventible causes of epidemic, endemic, and contagious disease.

The attacks in the least unhealthy districts of England were 1 in 269 of the population; in Aylesbury, 1 in 156.—(See the Tables published by the Health of Towns Association.)

EFFECTS OF THE EXTERNAL CONDITION OF DWELLINGS.—I found in this town as in others, an endemic tendency to stomach and bowel complaints in various localities, especially among the susceptible and poorer part of the population. Mr. Ceily, the medical officer, states:—

When common diarrhœa and cholera prevail, they are prone to pass into dysentery or remittent fever, and these disorders and fever of a typhoid type may be regularly anticipated and do periodically occur, but not without extending to other parts of the town whenever the weather and season favour their return and propagation. Diarrhœa and dysentery are frequently complications of severe catarrhal and bronchial affections of winter and spring, in cold, wet, and stormy seasons.

When the Asiatic cholera visited this town in the middle of June, 1832, no less than 61 deaths occurred in six weeks, the major part between the third and fourth visitation.

This disease was preceded a few months by an epidemic and contagious erysipelas, with much mortality. The Asiatic cholera commenced in those parts of the locality which are most exposed to humidity and the production of malaria, such as Duck-cnd, where the principal part of the sewerage of the town terminates and open ditches existed, a large surface of stagnant water, and where ducks and other live animals are kept in the dwellings and on the premises of the inhabitants.

In 11 days it reached the central parts of the town, having previously advanced in different directions to the outskirts, where in the abodes of

the poor, its severity and mortality were chiefly manifest, in situations the least healthy and the habitations most confined. In general, these localities are so vicious in arrangement as to prevent altogether in many cases the requisite ventilation, and in others materially obstruct ventilation, the floors and walls being constantly damp and unwholesome, combined with open and filthy ditches, the drainage in numerous instances being miserably deficient and in others wholly wanting. In 1840 the town was visited with a fatal epidemic of scarlatina.

The following are some of the places named as the seats of cholera:—*Whitehill houses*, in which the privy is placed in the wash-house, the excreta passing into an untrapped drain, where it remains for want of water to carry it off. Cooking, &c., is carried on in the same room, which joins the front sitting-room; the privy seat and excreta are entirely exposed to view without any enclosure of any kind, and placed between the back entrance door and window, nearly opposite the door leading into the sitting or living room. Fever constantly prevails in this place. *Four houses* occupied by Benwell and others: in these the privy is placed in the back passage, but the excreta and soil ooze up through the floor of the passage, and from the excess of moisture which pervades these premises, the occupants are under the necessity of mopping up the wet from the floors almost daily; the excreta being frequently washed up to the door of the dwelling. In a house occupied by Haystaff, in Oxford-road, the drain passes immediately under the floor from the back yard, and being made of pervious materials the effluvium finds its way into the room, whilst the back yard itself, from its being thoroughly saturated, is little better than one large cesspool. On the premises occupied by Mrs. Bowden, Oxford-road, also visited by the cholera, the sewerage from duck-ponds in the back yard passes under the brick floor of the living room, the soil oozing up between the bricks. Behind a row of houses is an open ditch which separates the backs of the houses from a garden. By the owner penning up the whole of the sewerage manure in this ditch (consisting of animal and vegetable matter in various stages of decomposition) in the form of a settling bed, and by periodically removing the solid for manuring his garden, he reaps a considerable profit, at the cost of the most noxious smells to his neighbours, who are often labouring under fever and other forms of sickness.

Spring Gardens, also the habitat of cholera, consisting of 11 houses with a double privy placed in front, from which the excreta flows over upon the surface of the adjacent ground; there is also an open ditch serving the purpose of a cesspool to all the houses, bounded on one side by the back wall (of the houses), the brickwork being saturated with the polluted fluid (from its absorbent property), considerable moisture escapes into the living rooms.

The following are some of the places named as the seats of typhus and other epidemic or endemic disease. *Winfield's Ter-*

race.—Several of these houses are furnished with brick tubs (in lieu of privies) built up in one part of the cellars, and immediately under the floors of living rooms: drains, untrapped, are laid from these tubs to the street, but for want of sufficient fall, the sewer in the street being above the level of the drains from the tubs, the occupants are obliged to take out the excreta (from these fixed tubs) and carry it into the fields; this they do in the night for fear of detection, not having the consent of the occupiers of land to deposit it thereon, the distance often exceeding one fourth of a mile; the cost or expense must therefore amount to about 6*d.* each journey.

Walton, near Beanbrook, is also the seat of fever and diarrhœa, the houses being often flooded knee deep in the cellars, and having an open cesspool charged with stagnant water. In *Castle-street* the excreta stands above the floor of the living rooms, and from contact with the absorbent materials percolates and runs down on the inside of the walls of adjoining houses; the privy has recently been erected, and within a period of six weeks six cases of fever are recorded.

Brerton-road has several houses which are also the habitat of fever. The privies are so placed as to discharge the excreta into an open ditch on the side of a field, where it lies even with the surface of the ground, the overflow being conducted into a pond at one end of the ditch, but within about 12 feet of a second row of 13 houses, forming one side of a court, and occupied by 71 persons.

Atkin's Yard contains six houses, chiefly occupied by aged and infirm persons, a day school for children, and contains one privy, but the only means of rendering this single privy to the whole number of the occupants bearable, is by a daily application of several pails of water. For this purpose one man appears to be regularly employed at a probable cost of 6*d.* per diem as the value of his time.

Houses in *Dropshort Back-street* and *Castle-street* are also the seats of typhus, &c.

The privy and cesspool arrangements may be thus classed.

1st. Houses without privies or any substitute.

2nd. Houses with privies but no proper discharge for the excreta.

3rd. Houses with tubs fixed and moveable placed in cellars and barns.

There are about 21 courts and alleys, containing 158 houses and occupied by 700 people, with but one or two privies at most in each court or alley; whilst in the town itself there is almost a total absence amongst the poorer class of dwellings of the ordinary means for the maintenance of decency and propriety. If one inference is more certain than another it is that immorality exists in proportion to the overcrowding, the filth, the scarcity of privies, the want of privacy where privies do exist, and

to the impurity and inadequacy of the supplies of water. And from the condition of the premises examined there are no less than 700 human beings living obviously exposed to preventible causes of disease. The causes are defective drainage, proximity to extraneous accumulations of decomposing substances, and insufficient accommodation for purposes of cleanliness.

VENTILATION.—In illustration of the importance of street ventilation, and the influence of locality in the production of disease, Mr. Ceily says:—

Soon after the formation of the Aylesbury Union in 1835 and 1836, the parish workhouse, which then stood in a meadow between the present silk factory and the lately erected National Schools in Green-end on the Oxford-road, was purchased by the Guardians of the Union. The building itself underwent much alteration and considerable enlargement, so that the space around, which before was free and open, became occupied by new buildings, out-houses, &c.; a high boundary wall was also erected. In these premises the inmates of the Union-house year after year were severely and fatally affected with gastric fever, diarrhoea, and dysentery: this state of things led to various measures, and all (that were practicable) were in succession adopted but without effect, so that it became necessary to decide on abandoning the building, as unfit for the purposes of the Union, solely from its insalubrity. A new Union-house has been erected on an open elevated situation to the north-east on the Breton-road. In the new building, which has been occupied since Michaelmas, 1844, dysentery has never arisen, and the autumnal gastric and intestinal affections are far milder and infinitely more rare than in any other part of the district, though no alteration of the diet of the inmates has been made. The Union-house hospital is made the receptacle of most of the chronic and protracted cases for different parts of the Union, and in the winter months nearly all the beds are often thus occupied.

The new Union-house is thus made subservient to the interests of the Union, and the hospital a benefit to the sick poor, instead of being the hot bed of disease, which the old Union-house most assuredly was.

That building being sold was partly pulled down and converted into distinct dwellings; and other detached houses have been erected on the same site by clearing some of the ground, and attention to drainage (although the latter is but partial), and by rendering the place more open (thus ventilating the area), it has been restored to an equal degree of salubrity with the rest of the vicinity, but it is susceptible of further improvement.

From a return made by Mr. Humphry Bull, relieving officer of the district, there appears to be no less than 19 courts and alleys without any outlets, and all more or less confined in width, containing no less than 700 persons. The width of the entrances to these alleys varies from 2 ft. 6 in. to 3 ft. 6 in., and in height from 6 ft. 6 in. to 10 feet and upwards, the effect being to prevent that free circulation of air, which was found essential in the case of the poor-house.

INTERNAL VENTILATION.—The dwellings of the poor and

labouring classes form together a considerable portion of the population. Mr. Ceily says (in his evidence)—

The habitations of the above classes are in general so defective in construction, and so vicious in arrangement, as to prevent altogether, or materially obstruct, the requisite ventilation. In many of these houses the floors and walls are damp and unwholesome.

These dwellings in numerous cases are built *back to back*, *i. e.* one room in depth, without any outlet of any kind whatever on more than one side. In numerous other instances houses in various parts of the town are entirely deficient in adequate outlets for ventilation, having merely a small fixed sash for admitting light only; these houses are situate in Marches-road, Nags Head-alley, Walton near the Brook, Wardfields-terrace, Upper Hundred, Buckingham Arms-yard, and other places.

HIGHWAYS, STREETS, AND FOOTPATHS.—The total length of public cart and carriage roads is as follows:—Township of Aylesbury, paved, 7 furlongs 14 poles; unpaved, 2 miles 1 furlong 34 perches. Hamlet of Walton, unpaved, 5 furlongs 5 poles, making in the whole 3 miles 6 furlongs 13 poles. The chief defects existing in the paved part of the roads consist in the form and clivity, which are such that the water hangs upon the surface instead of being led off in the direction of the quickest descent and confined to properly formed channels. Another and a greater evil attendant upon a want of proper form and rapid discharge of surface water will be found in the facility it affords to the deposit of filth upon the surface generally.

The market-place from not being paved, is often in a wet and filthy state, imparting moisture of the worst character to the surrounding atmosphere.

In the suburban roads the chief defect consists in the want of proper drainage. From the position and character of the side ditches, the seat of the road must necessarily be very full of water, and it is impossible to preserve the surface of a road when the sub-soil is saturated or even moist. Workmen find it quite impracticable to keep the road *down* in wet weather, obviously, because the particles of which it is composed are easily moved among each other, and by losing their tenacity become incapable of sustaining their form and position, and consequently are subject to displacement by the slightest weight. The least displacement of the material forming the crust is attended with a twofold evil, *i. e.* the loss of power and increase of wear and tear of the road itself, for the horses' feet must necessarily press with an increased force upon the road when they have to exert an increased power. If a cart were loaded with a ton weight and were to sink one inch into a stiff muddy surface, the draught would be about 303 lbs., but if the depth of sinking were only half an inch then the draught would be 215 lbs., or if it sunk only one-fourth of an inch the draught would be reduced to 152 lbs. The wear and tear will be

found to increase in proportion to the softness or fluid-like consistency of the material forming the road.

Roads formed with soft, rough, or irregular surfaces, and bad gradients, so as to offer resistance to draught, are a direct source of loss, both to the town and to the neighbourhood, from the waste of horse-power which they occasion.

The sanitary advantages of the drainage of roads by tubular drains are stated in the Report of the Metropolitan Sanitary Commission, where the following exposition occurs:—

On a mile of road having ditches on both sides, the extent of evaporating surface of stagnant moisture with decomposing vegetable and animal life, would be from three-quarters to an acre per mile, that is, three-quarters of an acre in extent could be gained as dry road or as cultivated land.

Again,—

Covered tubular drains, if properly laid down, carry away a larger amount of water and are less expensive than open ditches.

We are assured by persons engaged in carrying out agricultural improvement by land drainage, that the road side ditches commonly form the most serious obstructions to the work. Covered tubular drains would of themselves effect extensive land drainage, and in some suburban lands closely intersected with by-ways and public footpaths, if deep drained, would in many cases supersede the necessity of any other drainage.

Mr. Smith of Deanston, long since abolished all open ditches in his own farm and the roads adjoining with great advantage, and Mr. Parkes attests the fact (in which other experienced drainers examined by us concur), that a proper covered drain, of the same depth as an open ditch, will drain a greater breadth of land than the ditch can effect. The sides of the ditch become dried and plastered, and covered with vegetation, and even while they are free from vegetation, their absorptive power is inferior to the covered drain. A mile of double road drains would drain from 15 to 20 acres of the adjacent land, and the increased value of the land itself would, considering the common rates of charge for land drainage, be worth the expense. A piece of land surrounded by roads, as often happens in the suburbs of towns, might be completely drained by the road drains.

The occupiers of the new suburban dwellings have often no other means of drainage than the common ditches.

Mr. Stewart says,—

I do not think the other drainage (meaning land drainage) would be complete without it; that it would be inconsistent to leave the ditches as they generally are, say about 2 feet deep, and that the extension of the road drainage would be of great advantage to small owners or small occupiers.

REMOVAL OF DECOMPOSING REFUSE FROM WITHIN THE TOWN.
—The portion of filth arising from the public carriage-ways and market-places, is removed by the agent of the local surveyors, at a charge of 7s. per week, in addition to the right of the filth itself,

but it does not extend to the various passages, courts, alleys, or ashpits, of which there are a great number in the township.

The manure from stable and other cattle yards is purchased and removed by the farmers at an average price of 4s. per ton, to a distance averaging about 2 miles from the town.

The cost for removing soil by nightmen from privy pits averages about 10s. per ton. The fact is indicative of the state of agriculture in this district. The farmers will not take this most fertilizing manure, even upon being paid for so doing. But the reluctance arises from its use in a solid state, whilst the cost for emptying tubs, in cases where the contents are not thrown into street gully-holes, which is frequently the custom, amounts to about 1s. per tub, it being done by hand labour.

The sewerage manure is emptied partly into the brook and partly into an open ditch on the side of a brick-field, close to the town, but part of the soil, which passes into the open ditches, is pent back by the proprietors of adjacent lands, so as to convert the ditch itself into a settling bed, from whence, at intervals of time, they remove the solid portion of the soil on to the banks at the side of the ditch, and from thence to their gardens and lands.

The evil consequences arising from the arrangements detailed above, are,—The tendency to render different parts of the town the seat of cholera, typhus, epidemic or endemic disease, and also, as shown by Mr. Pickers, surgeon, who is in the practice of attending the poor, to prevent this class from adopting habits of cleanliness, being in an infinite number of cases unprovided with cesspools, drains, or privies. He further adds, the effluvium is most offensive, especially in the night, in different parts of the town, from this cause as well as from the filthy ditches which abound.

The evil attendant on the present plan of removing manure, from the different yards, consists mainly in the length of the interval which is in all cases allowed to intervene. The farmer, consulting his own convenience merely, and not regarding the injurious effects of large accumulations of stable and other manure on the health of the inhabitants, allows it to accumulate for many weeks, or even months, which is in some cases a positive benefit to him; for when the decomposition has sufficiently advanced, he is enabled to remove it at once to the land on which it is to be employed, in place of taking it to adjacent ground, and at a future time transfer it to the land; by this process, too often adopted, the farmer saves one removal of the manure, but it is at the cost of the health of the inhabitants of the town from whence he removes it.

The manure is too strong in its natural state; but instead of weakening the effect by dilution and by frequency of application, the farmer weakens it by decomposition. But in the process of decomposition two-thirds of the most valuable products escape, namely, the noxious gases, &c. This process, by delay, he allows

to take place in the thick of the population, which ought, of course, to be prohibited, and the manure saved, or, if wasted, it should be wasted on the farmer's own premises. But the Board will be disposed to ascribe this state of agriculture to the want of facility for better management. The individual farmer could not reasonably be expected to provide the means of conveying manure, chiefly in suspension in water, or of obtaining water for its dilution, and means for its frequent distribution. When such means as, under the Public Health Act may be extended to this district, are adopted, production may be carried beyond anything that has ever yet been seen. The average crops at present are estimated, for the uplands, at 3 quarters of wheat, $4\frac{1}{2}$ quarters of oats, 4 quarters of barley, $3\frac{1}{2}$ quarters of peas, or about 15 cwt. of hay per acre; and for the lowlands, 4 quarters of wheat, 5 quarters of oats, 5 quarters of barley, 4 quarters of peas, or 30 cwt. of hay per acre.

The average rent for the lowlands is about 35*s.* per acre, and for the uplands about 15*s.*

Taking the quantity of fertilizing matter, as deduced from analysis, at 5 cwt. per annum per individual, and the quantity of water necessary for diluting it, so as to render it fit for application at 17,920 gallons, it follows that a present loss is sustained of the value of about 120,510 tons of manure per annum.

APPLICATION OF MANURE AS TOP DRESSING.—Mr. Smith of Deanston says—

The practical result of the application of sewer water is, that land which let formerly at from 40*s.* to 120*s.* per Scotch acre, is now let annually at from 30*l.* to 40*l.*, and that poor sandy land on the sea-shore, which might be worth 2*s.* 6*d.* per acre, lets at an annual rent of from 15*l.* to 20*l.* That which is the nearest the city brings the higher rent, chiefly because it is near and more accessible to the points where the grass is consumed, but also partly from the better natural quality of the land. The average value of land, irrespective of the sewer-water application, may be taken at 3*l.* per imperial acre, and the average rent of the irrigated land at 30*l.* making a difference of 27*l.*; but 2*l.* may be deducted as the cost of management, leaving 25*l.* per acre of clear annual income due to the sewer water.

This gentleman further adds:—

I have ascertained that the quantity of sewer-water due to a town of 50,000 inhabitants amounts to about 1,190,080,946 gallons per annum, which quantity will yield an annual application of 17,920 gallons per acre to an extent of 66,410 acres.

Taking the average cost of guano and farm-yard manure, at the lowest estimate, at 2*l.* per acre, and deducting 12*s.* 9*d.*, the cost of the application of the sewer water, there will appear a saving due to the sewer water of 1*l.* 7*s.* 3*d.* per acre; allowing one-half thereof to go to the farmer, there will remain free income due to the sewer water of 45,241*l.*, which is nearly 1*l.* per head of the population. But there is, in addition, in the sewer water a vast amount of soap-suds, dish-washings, horse and cow

urine, the debris from manufactories, the washings of the streets, &c. At present in most towns much of the human excretæ, both solid and liquid, passes off into dung-pits, &c., but a more perfect system of sewerage would secure the whole of the liquid and dissolvable *debris* made within the town, so as to cause a much greater enrichment of the sewer water than exists at present anywhere, or than was found in the sewer water analyzed to afford data for this estimate. Taking a general view of the subject, we may safely assume a clear revenue from the sewer water of all towns of 1*l.* for each inhabitant, either in a direct money return, or partly to the inhabitants in a reduced price, from the increased abundance of produce. And it is obvious that such income, annually accruing, will provide a sufficient fund for the improvement of all towns, in a manner corresponding to the most enlightened views with respect to sanitary regulation and improvement of the present time.

Connected with this subject is the question of land drainage. In illustration of the cost, Mr. Hammond has stated, that he drained stiff clays 2 feet deep, and 24 feet between the drains, at 3*l.* 4*s.* 3*d.* per acre, and porous soils, 3 feet deep, and 33½ feet asunder, at 2*l.* 5*s.* 2*d.* per acre, but subsequently continued his drainage, at 4 feet deep, wherever he could obtain the outfall, from a conviction founded on the experience of a cautious progressive practice as to depth and distance, that depth consists with economy of outlay, as well as with superior effect. He has found 4-foot drains to be efficient at 50 feet asunder, in soils of varied texture, not uniform clays, and executes them at a cost of about 2*l.* 5*s.* per acre, being 18*s.* 4*d.* for 871 pipes, and 1*l.* 6*s.* 6*d.* for 53 rods of digging.

Sewers.—From the evidence of Mr. Gotto (the surveyors not having any plans of the sewers of the town), the total length of the various sewers is about 16,500 feet lineal, out of which only about 750 feet lineal is laid to a sufficient depth to drain the basement floors of the houses; whilst the lineal length of the public roads within the township of Aylesbury and hamlet of Walton amounts to 20,295 lineal feet.

The execution of the works extended over a period of 60 years, commencing from 1780, when the first portion was undertaken, and ending 1840, when the last part was executed. It is further stated, that some portion of the sewers commence at 2 feet in diameter, but decreasing in size to 18 inches, and from 18 inches to 14 inches towards the outfall.

From the nature of the material employed, the form and relative level of these sewers and drains, and the defectiveness of the construction, there is but a remote chance of any of them forming any part of an entire system of drainage, whilst from the insufficiency of these works, combined with the fact of the most noxious smells arising from the gully-holes, it is no marvel the inhabitants dread any future expenditure under the head of drains and sewers, finding little benefit and a large amount of evil from those already constructed.

WATER SUPPLY.—The sources from which the inhabitants at present obtain water, are—

1. From common draw wells.
2. By means of pumps.
3. From the roofage; and
4. From the brook.

But the labouring and poorer part of the population derive their supplies either from wells or the brook, whilst in most cases the water from each source is polluted, that in the wells being nothing more than surface drainage water, charged with impurities from cesspools, which, from their contiguity, cannot be otherwise; and that from the brook is taken at the spot, where cattle are watered and washed, and about 20 yards from the outfall of one of the sewers.

The following report contains a description of the hardness of waters at present in use:—

SIR,

*Museum of Practical Geology,
February 15, 1849.*

I now send you a report on the degrees of hardness of 20 waters from Aylesbury.

No.	Designation.	Hardness.	Remarks.
I.	Brook Water, near Mill Tail, opposite Mr. C. Green's house.	18 $\frac{3}{4}$	
II.	Brook before passing arch at Mr. Green's house.	19	
III.	Brook water after passing arch.	19	
IV.	Water from public well in Kingsbury said to be very good.	36	
V.	From a well on Mr. Tindall's premises.	50	
VI.	Well behind King's Head, at times very foul and unfit to drink.	86	This water had a horrible fœtid taste.
VII.	Well in Sharpe's yard, centre of town.	60	
VIII.	Well behind Red Cow, near Bull Pond.	74	
IX.	New well, site of old workhouse.	86	
X.	From well on Mr. Creely's premises.	84	
XI.	Well in Walton Hamlet . .	62	These two waters are labelled the same, but the difference in hardness has been verified by two examinations of each, and if, therefore, they be the same water, some accidental impurity has vitiated the results.
XII.	„ „ . .	77	
		0	
		1	
		2	
		3	
		4	
		5	

You will observe that all the waters in two series are very hard ; some of them excessively so.

I have, &c.,
(Signed) LYON PLAYFAIR.

The price charged for the water from the latter source is $\frac{1}{4}d.$ per pail of about two gallons ; consequently those who are too poor, or without funds to purchase, are driven to the only alternative left, to beg, and often as they admit, to steal, or to collect from the roofs of their dwellings ; but in the absence of proper eaves guttering, the supply from this source is very limited. One example may suffice to exemplify the strait to which the poor are exposed. One of the parties declared the only water they had for use was that which they collected from the roof of their dwelling, the covering being one of thatch : this is not a solitary instance of the effect of the privations of water arising from different causes.

25. COST OF MAKING WELLS.—The depths vary from 15 to 24 feet, and cost as follows :—

	£.	s.	d.
Sinking and steining well complete, 8 yards deep, } at 10s. }	4	0	0
Lead pump and wood frame	7	0	0
Stone trough	1	0	0
	£12 0 0		

The cost for repairs per annum, say at 5 per cent. on the outlay, will be 12s.

Water Butt.

	£.	s.	d.
Average cost	1	0	0
Annual repairs	0	7	0

And will last about 12 years.

But the major part of the houses are deficient in water-butts, and the occupants are therefore driven to the use of water-pails and washing-troughs for collecting rain water. Were it otherwise, and each house supplied with a water-butt, even then a difficulty would be experienced in times of drought, the average duration of which being in summer six and in frost two weeks, making a total of eight weeks, during which no roofage water could be obtained.

Aylesbury is not only deficient of good water, but also of that great preservative of health, *i. e.* baths, public and private.

NEW SOURCES OF WATER SUPPLY.—Having explored the surrounding district, I am enabled to state that three sources of supply presented themselves.

Artificial Pipe Drainage.—River and deep drainage, or as commonly called, lower springs ; there is also the ordinary surface drainage, from which the supplies for the prison are derived.

As to the advantages, relatively, and first as to those of artificial pipe drainage, compared with the ordinary surface drainage : the

former may be said to consist, 1st, In its being filtered from the particles of the soil and animal and vegetable matter which may be at the surface at the time of the rain fall, a condition due to the superiority of a bed of vegetation over settles or artificial filters; and 2nd, In the filtration being immediate, and accomplished before any great quantity of the surface matter can be dissolved, and get, as it were, into chemical solution, from which sand filters will not separate it.

It has been proved, however, that the natural filter constituted by a bed of earth, together with the roots of living vegetable, does separate a considerable quantity of matter that is passed by the finest sand filters.

That a filtration may be good, a great extent of surface and slowness of action are advantageous, and these arrangements are given by the vegetable filtration.

Rain water as it falls is highly aerated. If it be caught and conveyed away immediately through covered drains to deep reservoirs, much of the aeration, which, combined with the low temperature, constitutes the agreeable quality called freshness, may be retained.

The water thus caught, whilst it is more free from animal and vegetable matter than surface water or than river water, is also more free from mineral impregnations than the deeper drainage or lower spring water. It is more free from mineral matter than the river waters that derive their source from a flow through chalky districts, or from deep springs: for instance, the average hardness of Thames water from Oxford to Putney or Vauxhall is 16 degrees of hardness, whilst from the land in various adjoining districts in Berks and other parts the average hardness of the specimens from drained land is about one-half that amount, and from some tracks of ground abundant supplies appear to be attainable having less than one-third of the hardness of the water in the river.

From some sandy strata the water approaches to the quality of water from granite or grounds of primitive rocks.

Cæteris paribus there is an important reason for preferring water obtained from deep drainage, namely, that it will furnish the means of extending the drainage of land.

The depth at which any table of land may be best drained and the water most completely filtered, will of course vary; it is also a point upon which further experience is required.

It will be necessary to make provision for diverting the land drainage water during the time of dressing with manure, as well as for shutting off the surface drainage of main roads; all of which drainage must be dealt with as refuse water.

The plan of deriving a water supply from deep drainage or from immediate rain falls, requires larger and deeper storage reservoirs, but this may be provided for by making use of river water on the emergency of long droughts.

Taking the supply requisite for the town at the rate of 125 gallons per house per diem, and the rain fall being, say, 21·44 inches per annum, and the quantity saved from evaporation 7 inches in depth, there will be required for the supply of the present number, say, 1100 houses or 5500 inhabitants, about 356 acres of land; the drainage of this land together with appliances for the discharge of water at the time of manuring portions of the land, will cost on the average 6*l.* per acre. But it is not anticipated any portion of this charge, even if it be incurred, will fall upon the town, as the improved value of the land from drainage will in all cases more than compensate for the original outlay; the district itself being well adapted for both purposes.

It has been ascertained from the cost of existing water-works, that the estimated capital necessary to supply an entire district with water upon the system of constant supply, varies from 15*s.* per head for every person in the town, to 2*l.* At Nottingham the cost has not exceeded 15*s.*, and so far as a cursory inspection in the absence of accurate surveys will enable me to decide, I see no reason for doubting the possibility of supplying the town forming the subject of this Report, with all the necessary works at a sum not exceeding 30*s.* per head for every individual; and taking the repayment of the capital with interest, as distributed over a period of 30 years, the cost for supplying of water to the houses of the poor, including management and maintenance of works, will not exceed 1*d.* per week.

The Water to be filtered.—Before the Health of Towns Commission, the following exposition occurs:—

What would be the extra expense of the management to effect the filtrative process?—In general, about one-third of a penny per 1000 gallons, subject of course to local variations according to difficulty and expense of procuring sand, and in proportion to the extent with which the water might happen to be charged with sedimentary matter. In one work the expense of the filtration amounts to one halfpenny per 1000 gallons; in another to one-third of a penny; and in a third, the Southwark Water Company, to one-sixth of a penny per 1000 gallons, which for the supply of a labourer's tenement, assuming it to be 40 gallons per diem, would amount to about 4½*d.* per annum or one-third of a farthing per week.

That is to say, at 5 per cent. interest on the fixed capital, making altogether 8*d.* or 9*d.* interest and 4½*d.* management, little more than one shilling per annum, or less than one farthing weekly extra for ensuring the purity by filtration, of a supply of 40 gallons per diem for beverage, for culinary purposes, for washing, for baths where there are conveniences, and for all other purposes?—Yes.

What is your estimate as to the amount of matter detained by subsidence?—About one inch per month of mud, or rather on the average of the year is 12 inches. In fine weather there is very little, but during and after heavy rains there is a great quantity, which makes up the average.

Besides this what quantity is detained in your filtering beds?—

About an eighth of an inch of mud, and below that an inch of discoloured sand every eight weeks. But this eighth of an inch is so compressed as to be equal to at least half an inch of mud left in the reservoir of subsidence. Altogether the Thames water, as taken out at Battersea, would give about 15 inches of deposit in the year.

This then is the measure, is it not, of what must pass into the water butts and require cleansing where the same water is taken up and delivered without previous preparation by reservoirs of subsidence and filtering beds?—Yes.

And what for each 1000 gallons is the extra expense of cleansing such water?—About one-sixth of a penny; for a tenement receiving 40 gallons per diem, the expense will be about 4*d.* per annum, and for this the cleansing of the butt every week or fortnight is saved; besides, the filtered water may be at once used and the consumer has not to wait for any subsidence. Brewers, manufacturers, and other consumers have the same advantage. Formerly when there was subsidence, deposits were left at the bottom of brewers' coppers which furred them so much that holes were frequently burnt in them. Now that the clear water comes directly in contact with the metal, such accidents do not occur to the same extent. The housewives' kettles are better preserved, the fellmongers also dress their wool whiter, and those who use the filtered water get an advantage of about three farthings in the pound.

Care of distributing Apparatus.—In the next place the distribution should be so arranged as to deliver the water cool and fresh in summer, and of the medium temperature in winter; that is, by avoiding the common carelessness in laying the water-pipes very close to the surface to save the expense of digging. Moreover, it is found by experience, that water which has stood in tanks, particularly in towns, absorbs the town gases and becomes flat. This objection is to be avoided by distant reservoirs, where aeration of the water will take place.

The Public Distributory Apparatus to be complete.—The service-pipes on the premises, as well as within the house, including the waste and return-pipes, should be provided to be laid down under regulations, as part of the same general apparatus, as mains, &c., without any outlay on the part of the owner (unless he chooses), but to be paid for by annual instalments of principal and interest.

A service-pipe, and one tap at least, will be provided for each tenement, and various forms and descriptions will be offered for their choice; where there are separate tenements pipes should be provided for each cottage, together with one sink, and a return or waste-pipe; and as many more for upper rooms, or other parts of the premises as the occupiers, with the consent of the owners, choose to pay an improvement rate for, provided only it be according to the regulated sizes; or private individuals may provide any apparatus of their own. This will apply to the soil-pan, and other apparatus, which is to supersede the cesspool and soil-pit.

GENERAL CONTRACTS.—If the apparatus for each house requires an expenditure from the owner of 10*l.*, instead of enforcing

an immediate outlay from him to that amount, and compelling him to send for a bricklayer and a plumber, and incur bills of unknown and fearful extent, the whole will be commuted for an improvement-rate, say *2d.* or *3d.* per week, payable half-yearly by the tenant.

In speaking of the advantage to the public in respect to the saving of repairs, Mr. Mylne says:—

Under ordinary circumstances, when an accident happens within or without the building, the tenant has to think how it is to be repaired, and has to consider how he is to pay for it, and who is to be sent for; the plumber, when he arrives, makes the repairs in his own way, which is without reference to any general system. Two-thirds of the labour, on the occurrence of any accident, is in the journeys which would be rendered unnecessary under a general system, by which, on such an occurrence, the inconvenience may be remedied at once.

In regard to the advantages to the rate-payers of making provision at wholesale prices, and of having the whole maintained for a term, as well as laid down by contract, as compared with the common method, by which every uninformed occupier or owner is dependant on, or under the necessity of employing, a separate plumber to complete as he chooses that part of the general machinery. In the first place, Mr. Mylne says, “it would effect a considerable saving of capital; in the next place, it would be done on principle, and in a superior manner. The trading plumber has no motive to carry out improvements, and two lengths of pipe may be put where one would serve. As an example,” he says, of the improvement proposed in detail, “I had intended to introduce lead-pipes with screw-joints, similar to those used in wrought-iron pipes. The cost of these joints were not above a *penny*, they would have superseded completely the plumber’s joint, and neither the plumber nor his irons, fire, ladle, and labour were necessary, and an expense of *3s. 6d.* per joint was saved.”

Where an intermittent system of supply is adopted, in a house of the first class in the metropolis, for example, the water-rent is *6l.* per annum, the original outlay for the supply of cisterns in different parts of the premises, will frequently amount to above *75l.*, requiring a rent of *5l.*, and, with dilapidations, *7l.*, or *10l.* per annum; and for a house of the second and third class, the amount for cisterns, &c., will require a rent of *3l.* and *2l.* respectively, exclusive of dilapidations. The advantages derived from a constant supply, independent of an entire saving of the above rentals for each class of property, has been described by Mr. Ashton (a large holder of cottage property) in evidence thus:—

On occasions of intermittent supply more water is used than when it is on constantly. When it was let on occasionally for fear of inconvenience, they filled all their pans that they might not be straitened; they drew constantly twice as much as they used. When the water came on again they threw away the water that was unused, and took a fresh supply.

Have you noticed any effect on the health?—Yes, very great indeed; cleanliness has always a tendency to health, and they are much more cleanly.

It is a complaint in respect to the poorer districts, where the population are actively occupied, that the cleansing and proper care of their receptacles for water or butts is greatly neglected, and that they become the source of impurity; but these causes of impurity are prevented by the constant supply, which involves the keeping of the pipes full.

The constant supply system diminishes the rate of delivery in the service-pipes and submains very materially, distributing over a greater number of hours the quantity of water which otherwise must be delivered in a very short period. The word "equalize" does not apply, because the current of water in the great leading main is but little affected.

It is spreading the supply over the 12 hours of the day?—Yes, and with the advantage that, as the water travels more slowly through the pipes, and smaller pipes will be equivalent to larger, the diameters of the service pipes and sub-mains are diminished about one-third, and the weights of the pipes about one-half.

The saving in the size of the service pipes, the mains, and so forth, would compensate for the cost of throwing up by engines an additional quantity of water, to meet the apprehended waste and additional consumption, and keeping it constantly on?—Yes, and the management is much more easy, and the number of men necessary to superintend the distribution of the water becomes much fewer, in fact it demands very little attention indeed where the water is constantly running through the pipes; but where the water is given at intervals many people are put to great inconvenience; then they are complaining and must be attended to, and the ball-cocks when they go down will stick very frequently, and there is consequently a great waste of water, so that a great deal of water is not well applied.

Under the system of constant supply, in order to obviate the least inconvenience from severe frosts, a stop-cock to turn off the water and a discharging cock to empty that pipe may be used; but the better mode is rather to protect the pipes by surrounding them with non-conducting substances of a sufficient thickness than by emptying them; attention to which is occasionally neglected.

By the terms of the Act the supply of water must be "pure and wholesome," *i. e.*, free from animal, vegetable, or mineral matter, and at the same time not flat but well aerated.

The supply must be "proper," a word to be taken in its fullest sense. It must also be "sufficient" for all the purposes comprehended in the "Public Health Act."

The result of a personal examination of the district effected by a reference to the Ordnance survey, although designed as a preliminary reconnoissance, has enabled me to arrive at the conclusion that water, answering to the several conditions required by the "Act," may be obtained from two distinct sources, *i. e.* distant springs, and a branch of the river Thame. If taken from the

former place, the supply will be by gravitation, if the latter, engine power must be employed. But in the present instance, there will not be any material difference in point of cost, as by adopting the springs there will be the additional expense for land storage, reservoir, and its appendages, about six miles of extra delivery main as a set-off against engine power; for in either case a delivery reservoir will be necessary, at any rate preferable to forcing the water directly into the mains by engine power, and absolutely necessary where the water is derived from a distant source.

For the delivery reservoir two sites present themselves: one in the Friarge path, the other near to Bull Close and the most elevated; but the proximity of the former to the river affords some additional facilities for working that will about compensate for the extra cost in construction, and therefore the final selection of a site may be left for future consideration.

For the final designing of the works and the preparation of estimates sufficiently exact for tenders or contracts, there would be required an accurate survey of the town, embracing such details as the gradients for showing the most advantageous distribution of the sewerage manure, and to guide the improvements of the levels of streets when repairs should offer opportunities of diminishing irregularities at small cost. Also for laying down the water-pipes and providing for future additions to the town and drainage area.

This remark upon the present want of sufficient data and the cursory nature of the examination of the district, will be borne in mind by the Board, when considering the conclusions arrived at as to cost from an examination of the results of works executed in other towns.

Some of the most determined opposition has come from the owners of small houses in lanes, courts, and alleys. In most towns, and under most local Acts it has been the usual course to compel the persons called owners, to pay half of the expense for paving the street or court to the middle, and sometimes to compel them to do it themselves; in others it is left undone, the consequence being the exposure of a large evaporating surface. Now it has been previously explained that this kind of property is commonly in the hands of persons, such as lessces, with very short interests; and where such provisions have been put in force on persons having short unexpired terms of leases, the measure has amounted to a confiscation of rents for the period. In this case, as in the case of the construction of new privies, or the laying down house drains, or carrying water into the premises, such new works being as much additions to the tenement as if a new room were built, they will be additions not contemplated by the tenant, and they are for the tenant's benefit; they are in reduction of charges existing upon the tenant, who ought to pay his proportion for these

benefits. It is alike unjust and impolitic to allow of benefits being given gratis. In the case of a new pavement, instead of its being laid down as heretofore at an immediate outlay upon the landlord, it should be laid down at the public expense, and paid for by annual instalments of principal and interest.

Assuming the foot pavement to be made of well-boiled gas-tar, which is called bitumen or asphalte, it may be done at 1s. per square yard.

If the house is 20 feet frontage in a street 10 yards wide, 33 square yards will be required to be charged to each house, together with the annual repairs. The wear and tear of this cheaper pavement are at present unsettled, but a rate of a little more than 1*d.* or 1½*d.* per week, has been considered about the sum, and should cover the pavement rate for the lower class of tenements. This will certainly lead to a reduction of the charges of the family in the house for washing, if not for the wear and tear of shoe leather and clothes caused by the dirtiness of the street. The contribution is not for the pavement in front of the door merely, but being a general contribution by every occupier it obtains for each family the privilege of walking through the whole town on dry and paved streets, instead of wading through mud and dirt, yielding effluvia to the injury of the health. The effect of dry pavement on the health of the children has often been strongly marked. It is a great relief to over-crowded rooms by enabling the children to play more in the open air, and rendering that of the rooms of a purer nature. Reductions in the amount of disease have followed the introduction of pavements alone, apart from any other alterations.

It may be observed, by the way, that we have not at present any materials suitable for pavements of a quality superior to the asphalte, and of a much less cost than Yorkshire stone. But it is stated that improvements are in progress, which promise a pavement of tile superior to the York pavements in quality (durability,) at from one-half to one-third of the common price.

The rate of cleansing the foot and roadway pavement (a matter too frequently neglected entirely in many parts of the town, and but imperfectly done in others,) by the jet, would for this class of pavements, fall at less than 1*d.* per week, which, with all other charges the owner will be entitled to levy as an addition to the rent.

Claim to exemption from the lower Class Tenements from Contribution.—It is a common practice to excuse this class of tenements, and sometimes all tenements under 10*l.* a-year, from the payment of rates; and no doubt efforts will be made, on the old plea of inability, to obtain the like exemptions.

Reasons against Exemptions.—On the principle already in part set out, this practice should be discontinued.

1st. Because if the money be properly applied, and the works

properly executed, of which care will be taken, these charges are in fact means of economy to the poorest occupier. To the poorest they are reductions of existing charges. Take for illustration the subject of water, in respect of which a charge of 1*d.* per week for a supply of from 50 to 100 gallons per diem, and this carried up to the highest garrets. If a woman could knit stockings, or sew shirts, or execute any other kind of needlework, it would be an act of extravagance for her to go from the top of the house to the bottom to fetch water, though when she got there she were to have the water gratis: and no human labour can fetch or carry water so cheaply as it can be delivered even by steam and machinery.

2nd. Those who yield to these exemptions are perhaps not at all aware of the proportions of these lower-class houses to the whole number.

In Aylesbury, 500 out of the 1200 houses are under 5*l.* of yearly rental. But if the number of these lower-class houses is a reason for not exempting them from the rates, it is also a reason for making these rates as moderate as is compatible with efficient works.

Total Number of Houses of each Class in Aylesbury, as rated to the Poor's Rate.		Per Cent. of each Class to the Total Number of Houses.	Weekly Rate or Contribution of each Class of Houses, for			
			Water Supply.*	House and Main Drainage.	Road Watering.	Total Weekly Charge.
From £3 to £5	No. 500	41 $\frac{7}{10}$	s. d. 0 1 $\frac{1}{2}$	1 <i>d.</i>	0 $\frac{1}{2}$ <i>d.</i>	3 <i>d.</i>
5 ,, 8	400	33 $\frac{3}{10}$	0 1 $\frac{3}{4}$			
8 ,, 12	200	16 $\frac{7}{10}$	0 2 $\frac{1}{4}$			
12 ,, 25	60	5	0 3 $\frac{1}{2}$			
25 ,, 40	25	2 $\frac{1}{10}$	0 5 $\frac{1}{4}$			
40 ,, 80	10	$\frac{1}{10}$	0 10			
80 ,, 110	5	$\frac{1}{10}$	1 1 $\frac{3}{4}$			
1,200						

* Manufactories, breweries, &c., 3*d.* per 1000 gallons.

If all houses under 5*l.* were excluded from contribution, and the interest on the whole amount of the fixed capital, and establishment charges for the supply of water were charged on the middle and higher classes, or on those inhabiting houses above 5*l.* per annum, then the payment, to be fairly remunerative, must be required in some such proportions as hereunder stated:—

	£5 to £8.	£8 to £12.	£12 to £25	£25 to £40	£40 to £80	£80 to £110.
Weekly charge about	d. 2 $\frac{1}{2}$	d. 3 $\frac{1}{4}$	d. 5	d. 7 $\frac{1}{4}$	s. d. 1 2 $\frac{1}{2}$	s. d. 1 8
Instead of	1 $\frac{1}{2}$	2 $\frac{1}{4}$	3 $\frac{1}{4}$	5 $\frac{1}{4}$	0 10	1 1 $\frac{1}{4}$

PUBLIC-HOUSES.—There are in the town and hamlet of Walton

no less than 41 public-houses, and 20 beer-shops. In the parish of Stevenston there are 33 inns, public-houses, &c., to an estimated population of 833 families, consisting of 3681 inhabitants. The expenditure in beer and spirits in the latter place is estimated at 4125*l.* annually, a sum that would pay the rent and taxes of upwards of 500 new cottages at 8*l.* per annum each.

DRAINAGE.—In many parts of the town recourse may be had to back drainage. The advantages in efficiency and economy of the plan are these:—

The saving of the expense of taking up the floors of front kitchens or rooms.

The saving of lengths of pipes.

And in respect to the drains, the most important advantage is the gain of fall, drainage at the back giving commonly three times the amount of fall that a front drainage would allow. The time of discharge of decomposing matter from beneath the premises by the back drainage will be generally as one to eight compared with the front drainage.

The common objections to the back drainage are the objection to the entry upon back premises, and the distrust and hostility of neighbours. This objection, however, may be overcome by appropriate arrangements. Under such arrangements, one neighbour would not have to apply for permission for his servants to enter upon the premises of another, but the whole erection of the drainage and water apparatus would be chargeable and charged upon a person appointed by the contractor, who is bound to keep it in order. In case of any stoppage it is that officer (who may be called the street-keeper or officer of nuisances) who would be applied to; of course he would be required to make his entry at proper times, and to do his work in such a manner as to afford no just ground of offence. Objectors will find less of intrusion upon the system of drainage through back premises than on the present system, which brings with it frequent stoppages and consequent intrusions upon the front premises, above all, the intrusion of bricklayers, and, under the present system, that of their bills.

Owners of smaller tenements are apprehensive of immediate outlays.

The immediate outlays falling, in the majority of cases, upon owners who have only short terms must fall unjustly.

To the utmost extent practicable the whole of the apparatus for private tenements will be defrayed by the public, that is to say, so far as the owners are willing, from the public rate, and with distributed charges which will be payable on each particular tenement by the person who derives the benefit, except in those cases where the tenement is let to weekly tenants or others whose rents are payable at shorter periods than quarterly or half-yearly,

in which case the owner being the only available person must stand in the place of the occupier, and he must pay the improvement rate and collect it back from his fluctuating tenantry.

In the several parts of the town where there are no privies, as well as in other parts where there is an insufficiency of privy accommodation, it will be necessary to erect proper privies. If they are erected by the owners the expense will be excessively heavy, and the immediate outlay will often form an insuperable obstacle to the provision, the ordinary expense being from 5*l.* to 8*l.* for the construction of a new privy.

Now it has been suggested, that if they were made of hollow brick, and constructed in numbers, the expense as estimated would be about 40*s.* each, and with the soil-pan costing 10*s.*, they might probably be well fitted up complete for 3*l.* In such cases instead of calling upon the owners for the immediate outlay of 3*l.*, three or four shillings per annum may be placed as it were on assessment upon the particular tenement as an improvement rate for the 20 years, and collected with the Poor-rate or some other consolidated rate.

The cost, in the absence of the requisite engineering details necessary for estimates in the aggregate for future plans for the charges per house must be deduced from works of a similar character executed in other places and from the experience of general estimates.

The basis upon which it is desirable to establish future plans is that of a constant supply of “*pure*”—“*wholesome*”—and “*proper*” water, public and private drainage of areas, houses, and roads; distribution of liquid manure so as to render it productive—a manure which, from its superior quality, it may fairly be anticipated will be eagerly sought throughout the district for which it may be applicable, and rendered a source of profit alike to the farmer and the inhabitants when means of applying it are provided; improving the ventilation of courts, alleys, and yards as well as back and front houses; daily cleansing of roads and pavement.

The present expenditure of the town taken as near as can be conjectured, which it is proposed to divert for works, consist of—

1st. Cost of emptying privy pits and cesspools. Assuming that one-third of the houses are furnished each with its own privy, and that the annual cost of emptying is 10*s.* per house; that one-third of the remaining two-thirds of the houses have one privy pit in common to every two houses, but subject to the same annual charge of 10*s.* per pit; and the remaining one-third as making use of tubs, allowing one tub to every three houses, and the cost of emptying in money or time 1*s.* per tub per month as the average in each case; and for the present water supply, assuming that one-third of the houses are furnished with a private well and pump, taking the cost of repairs, &c., at the annual rate of 15*s.*

per house, and the expenditure for the labour of pumping at *3d.* per diem; taking the remaining two-thirds of the houses to derive their beverage water only at the charge of one-eighth of a penny per gallon, the price now paid, and each family to be supplied with two gallons per diem, either by purchase or at the cost of their own labour; it follows that the expenditure under this head amounts to $1\frac{3}{4}d.$ per week for each of the remaining two-thirds of the houses. Upon an average, therefore, the total of these several expenditures will amount to the sum of say *3224l.* per annum, the whole, of which may be diverted towards the payment of interest and principal for new works.

In naming the charges per house for the works which are indispensably necessary for bettering the sanitary state of the town, and thereby relieving the rates and charges for sickness, I place reliance upon the known results of established water works, and the estimated cost of draining as recorded in the several reports, the accuracy of which I see no cause to question. These charges are for water supply *1d.* per week per house for the poorer class, public drainage $1\frac{1}{2}d.$ per week, paving and daily cleansing $1\frac{1}{2}d.$ per week; making a total of *4d.* per week per house.

In order to carry out the necessary improvements contemplated by the Public Health Act, I agree as to the necessity of placing the whole under one and the same arrangement, all forming one part of one system, and not allowing the various parts of the combined system to be taken possession of by separate authorities irresponsible for joint action, the tendency of which must be to damage the beneficial operations of the whole of the works, as well as to increase in a very great degree the annual expenditure, and in important details so to modify the works of construction as to add considerably to the original outlay without producing one single advantage.

The drainage of houses, situate in the numerous courts, alleys, and yards, may be accomplished, nearly in every case, with four inch tubular submains of glazed stone-ware, and each house supplied with a sink closet pan to privy, and all requisite syphon traps, junction pieces, and bends, together with service pipes for water supply (from mains), and cocks complete, for about *4l. 10s.* per house, or an annual instalment of something less than *5s. 6d.*, and the larger houses, with the addition of a sink on the second floor for *6l. 10s.*, or an annual instalment of *7s. 6d.* per house.

The Act empowers the Local Board, with the consent of the General Board, to borrow any money required for works of a permanent nature, not exceeding the assessable value for one year on the premises assessable under the Act within the district, in respect of which the money shall be borrowed. The net annual value of rateable property in Aylesbury has been estimated at *17,844l.* This is, therefore, the amount which may, with the sanction of the General Board, be borrowed for the purposes of this

Act. But from the best attention I have been able to bestow upon the subject, the total amount of capital required for the construction of permanent public works, so as to effect the objects recommended as necessary for bettering the present unsatisfactory state of Aylesbury, and hamlet of Walton, will be for—

Waterworks	£9,000
Street sewerage	5,000

IRRIGATION.—A considerable portion of the town is of sufficient height above adjacent lands for the application of the sewerage manure by gravitation; but for the lower parts of the town, and in order that no portion of the sewerage may in future be discharged into the brook or river, engine power will be necessary to effect its distribution.

The surrounding district, to a much greater extent than will be required (for distribution), is favourable to its application; the area necessary is estimated at 6000 acres.

LOCAL ACTS OF PARLIAMENT.—Inspectors of Lighting and Watching were first appointed under the Public General Act of 3 and 4 Will. IV., c. 90, about the year 1833.

An Act for rating tenements under the value of 10*l.* to owners instead of occupiers, passed in 1846.

The General Highway Act.

CONCLUSIONS.—Having carefully investigated the facts brought before me, upon the subjects to which my inquiries have been directed, as well as the facts disclosed in the course of a reconnaissance and personal examination of those localities where epidemic, endemic, and other diseases prevail, I am of opinion that a very large amount of the excessive sickness, and the great excess of premature mortality, may be materially alleviated, and the numerous existing accumulations of filth that at present abound be prevented in future, by the application of the provisions of the Public Health Act to the township of Aylesbury and hamlet of Walton. In furtherance thereof I recommend—

First. That the drainage area as shown by the Plan No. 1, be adopted as the most eligible; in which case it will not be necessary to enlarge the existing boundaries.

Second. That powers be taken for carrying out the following correlative measures:—

1. For an abundant supply of pure water upon the constant system, filtered, and carried into every tenement, for domestic use, for cleansing and household purposes, the cost of which, I am of opinion (judging from the cost of existing water-works), will not exceed the amount of 1*d.* per house per week.

2. For converting existing privies into water-closets, and, in the numerous instances where neither privies nor water-closets exist, for erecting water-closets.

3. That powers be taken for draining, by means of tubular or

other efficient drains, houses, courts, areas, and roads systematically.

4. That powers be taken for daily cleansing the carriage and footways by the application of water, and so as to prevent the accumulation of mud and filth. The results of experiment show that this work may be done at the cost of $1\frac{1}{2}d.$ per week per house.

5. That powers be taken to render the sewerage manure of the town productive, and which, as I have before stated, I am of opinion, may be done beneficially and profitably to all parties, farmers as well as the inhabitants, when the necessary arrangements are made for its distribution.

6. That all blind alleys be converted into thoroughfares, in order that the noxious vapours may be dissipated by currents of air, or diluted by access to large open spaces. In furtherance thereof I am of opinion that all dead walls should be taken down, and open fencing be substituted.

7. That powers be taken for a complete system of ventilation of the several rooms of tenements and parochial and other schools for the children of the poor, and also for preventing overcrowding, by regulating the number of persons to the size of the sleeping-room.

8. That powers be taken for placing fire-plugs throughout the town, and supplies of water kept on night and day, for the extinction of fires.

9. I am of opinion, that in all cases where the object is to reduce the amount of sickness and premature mortality to a minimum, it would be highly inexpedient to relinquish any of the above-named measures, but that they should be systematically carried out and maintained in an efficient state in all respects.

Lastly. From the best attention I have been able to bestow on the various points, I am of opinion that the several measures herein named may be carried out at a positive saving to the town taking into account the various existing charges and expenditure.

I have the honour to be,

My Lords and Gentlemen,

Your most obedient servant,

WILLIAM RANGER,
Superintending Inspector.

